1. X-ray production & basic properties
   - common sources for diffraction experiments
   - synchrotron radiation
   - response to x-rays by an electron
   - refraction index
   - total external reflection & evanescent wave, TXRF

2. X-ray scattering basics
   - scattering by an electron
   - polarization dependence
   - scattering by an atom
   - atomic scattering factor
   - anomalous dispersion corrections

3. XRD from a crystal
   - reciprocal lattice
   - scattering by a small crystal
   - Ewald sphere construction
   - lattice strain & distortion
   - temperature effect: Debye-Waller factor

4. Diffraction from surface structures
   - specular reflectivity
   - crystal truncation rod (CTR)
   - grazing incidence diffraction (GID)
   - low-energy (LEED) and reflection high energy (RHEED) electron diffraction

5. XRD experimental methods
   - x-ray diffractometry: reciprocal space mapping
   - powder diffraction: energy-dispersive (EDX) and angle-dispersive (ADX)
   - white-beam Laue method
   - crystallographic phase problem
   - anomalous diffraction: single-wavelength (SAD) & multi-wavelength (MAD)

6. X-ray scattering by amorphous materials
   - wide-angle x-ray scattering (WAXS)
   - small-angle x-ray scattering (SAXS)
   - Guinier analysis
   - Porod law
   - grazing incidence SAXS (GISAXS)